

LINK MODEL FOR MULTI-PREFIX PACKET SYSTEM BEARER

BACKGROUND OF THE INVENTION

- [0001] 1. Field of the Invention
- [0002] The present invention relates to methods and apparatuses for providing a link model for a multi-prefix packet system bearer, e.g. an evolved packet system bearer.
- [0003] 2. Related Background Art
- [0004] The following meanings for the abbreviations used in this specification apply:
- [0005] 3GPP Bearer=a dedicated point to point connection for a UE
- [0006] 3GPP=third generation partnership project
- [0007] ANDSF=access network discovery and selection function
- [0008] API=application programming interface
- [0009] APN=access point name
- [0010] DSMIPv6=dual stack mobile IPv6
- [0011] eNB=evolved nodeB
- [0012] EPS=evolved packet system
- [0013] GGSN=gateway GPRS support node
- [0014] GPRS=general packet radio service
- [0015] GRE=generic routing encapsulation
- [0016] GTP=GPRS tunneling protocol
- [0017] HeNB=home eNodeB
- [0018] IAP=internet access point
- [0019] IPv6=internet protocol version 6
- [0020] ISP=internet service provider
- [0021] L1=Layer 1=physical layer
- [0022] Link=interface at link layer (layer 2)
- [0023] L-GW=local gateway
- [0024] LIPA=local IP access
- [0025] MAPCON=multi access PDN connectivity
- [0026] MME=mobility management entity
- [0027] NIC=network interface connection at physical layer
- [0028] OPIIS=operator policies for IP interface selection
- [0029] OS=operating system
- [0030] PDN=packet data network
- [0031] PDP=packet data protocol
- [0032] PGW=P-GW=packet data gateway
- [0033] PMIPv6=proxy mobile IPv6
- [0034] PPP=point to point protocol
- [0035] RA=routing advertisement
- [0036] RAT=radio access technology
- [0037] SGW=S-GW=serving gateway
- [0038] SIPTO=selected IP traffic offload
- [0039] UE=user equipment
- [0040] ULA=unique local address
- [0041] USB=universal serial bus
- [0042] 3GPP Rel-8 has introduced dual-stack for EPS, and 3GPP Rel-9 has supported dual-stack correspondingly for GPRS bearers. That is, PDN/PDP type has been extended to IPv4v6, i.e., both IPv4 and IPv6 addresses are available to a UE.
- [0043] Based on agreed IP addressing principle, exactly one IPv4 address and exactly one IPv6 prefix can be assigned to the UE (excluding link scoped prefix) per a PDN connection/PDP context.
- [0044] New features beyond 3GPP Rel-9 like LI PA, SIPTO, MAPCON, OPIIS and equivalent mechanisms have shown that there is a need for more IPv6 prefixes per bearer, for example to have a separate prefix for user traffic “offloading” purposes.

[0045] The current 3GPP bearer model is proprietary and tailored for 3GPP terminals by assuming that end-users will use mobile operator provided packet switched services.

[0046] However, smart phones are coming into the market that use ordinary internet services, and their operating systems implement their IP stack and network interfaces at link layer according to generic IP networking principles. Thus, interworking between applications using socket based IP stack in a smart phone OS and a 3G modem using bearers is quite complex.

[0047] A proprietary 3GPP bearer model that is limited to one IPv6 prefix per PDN is becoming problematic especially when IPv6 will be applied in larger scale.

[0048] IPv6 is by design a multi-addressed and -prefix architecture, in which an interface must have a link scoped prefix and then may have zero or more prefixes of wider scope (ULAs, globals, . . .). ISPs with complex content & service provisioning structure and access infrastructure sharing settlements make use thereof.

[0049] The 3GPP bearer model comprises an “old” point-to-point link model used since GPRS, in which the link is between a UE and a PGW/GGSN, and a “new” point-to-point link model used with PMIPv6, in which the link is between a UE and an SGW but an IPv6 prefix/IPv4 address is still topologically anchored to a PGW.

[0050] Since GPRS times 3GPP compliant host OSes have abstracted a PDP connection as a dial-up “PPP-like” interface. Modern host OSes wish to abstract everything as IEEE802 type interface. This results in not working combinations due to false assumptions made at both end host and network side regarding link model and addressing.

[0051] A 3GPP solution for multiple prefixes is to establish a new default bearer (PDN connection) each time a new prefix is needed in the UE. However, this causes unnecessary overhead.

[0052] According to patent application US 2011/110378 A1 “Method And Apparatus For Communications Traffic Breakout”, published on May 12, 2011, more than one address per PDN connection/PDP context is used in order to offload local breakout traffic in a “middle-box” on the data path by using source address lookup (IP address, Ethernet address, or the like).

[0053] According to these applications, the current 3GPP bearer model is changed to support multiple addresses per PDN connection.

SUMMARY OF THE INVENTION

[0054] Methods and apparatuses are proposed that overcome the above drawbacks. In particular, methods and apparatuses are proposed that provide for a link model for a multi-prefix packet system bearer, e.g. a multi-prefix EPS bearer.

[0055] These methods and apparatuses are defined in the appended claims. The invention may also be implemented by a computer program product.

[0056] According to an embodiment, an IP link model for a multi-homed link that is passing via multiple network elements is provided.

[0057] Smooth interworking between applications using a socket based IP stack in a smart phone OS and a 3G modem using bearers can be achieved with this link model.

[0058] The above and still further objects, features and advantages of the invention will become more apparent upon referring to the description and the accompanying drawings.